

## Repair Manual TT 2015 ➤

Paint

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Edition 09.2023



## List of Workshop Manual Repair Groups

### Repair Group

00 - General, Technical Data

54 - Paint



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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## 00 – General, Technical Data

### 1 Safety Precautions

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#### 1.1 General Safety Precautions

**Risk of accident due to the vehicle rolling.**

When working on a vehicle, it always needs to be secured against rolling.

- ◆ Automatic transmission/dual clutch transmission: select “P”.
- ◆ Manual transmission: engage 1st gear.
- ◆ Activate the parking brake.

**Risk of injury from radiator fan**

Parts of the body can be clamped or pulled in from an automatically starting radiator fan.

- ◆ Keep a distance from the radiator fan when working near the radiator.
- ◆ Do not touch the radiator fan when disconnecting the connector.

**Risk of injury from UV radiation and glare**

Eye and skin health may be damaged from the headlamp turning on.

- ◆ Do not look into the light beam.
- ◆ Switch off the ignition and all electrical equipment.
- ◆ Place the vehicle key and other drive authorization systems (for example smartphone) outside of the vehicle.
- ◆ Do not operate the flasher.

- ◆ Only disassemble the LED headlamp according to the repair manual.

#### **Risk of suffocation from refrigerant R744**

The vehicle interior carbon dioxide concentration sensor is not functioning when working on the vehicle with disconnected 12 V vehicle battery.

- ◆ Only perform work in the vehicle interior with the doors opened.

## **1.2 Safety Precautions when Working on Vehicles with High-Voltage System**

### **Life threatening danger from high voltage**

The high-voltage system is under high voltage. Electrocution by direct contact or electric arc can cause severe bodily injury or fatal injury.

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- ◆ De-energize the high-voltage system when working on the high-voltage system.
- ◆ Have a high-voltage technician (HVT) or a high-voltage expert (HVE) de-energize the high-voltage system.
- ◆ Work procedures that require the system to be de-energized.

Refer to ⇒ Rep. Gr. 00 ; High-Voltage System Danger Classification .

### **Life threatening danger from electric and magnetic fields**

There are electric and magnetic fields on the high-voltage system. Death or severe physical injuries are possible due to a malfunction of active implants (for example pacemakers, insulin pumps).

- ◆ People with active implants may not perform any work on the high-voltage system.

### **Life threatening danger from high voltage if high-voltage components and cables are damaged**

The high-voltage system is under high voltage. Electrocution by direct contact or electric arc can cause fatal or serious bodily injury if high-voltage components and high-voltage cables are damaged.

- ◆ Perform visual inspection of the high-voltage components and high-voltage cables.
- ◆ Do not use chipping, deforming or sharp-edged tools near high-voltage components and high-voltage cables.
- ◆ Do not weld, solder, thermally bond or use hot air near high-voltage components and high-voltage cables.

### **There is a risk of damaging the high-voltage cables.**

Incorrect handling can damage the insulation of high-voltage cables or high-voltage connectors.

- ◆ Do not use high-voltage cables and high-voltage connectors for support.
- ◆ Do not use high-voltage cables and high-voltage connectors to support tools.
- ◆ Do not bend or kink high-voltage cables.
- ◆ Pay attention to the coding when connecting the high-voltage connectors.

### **Risk of injury from activated stationary air conditioning**

The stationary air conditioning can switch on unintentionally on electric and hybrid vehicles with stationary air conditioning enabled. Parts of the body can be clamped or pulled in by an automatically starting radiator fan, fresh air blower and moving parts on the heater and A/C unit.

- ◆ Deactivate the stationary air conditioning and timer function.

## **1.3 Safety Precautions when Working on Cooling System**

### **Risk of scalding from hot coolant**

The cooling system can be pressurized. Risk of scalding from hot vapor and hot coolant.

- ◆ Wear safety gloves.
- ◆ Wear protective eyewear.
- ◆ Release the pressure: use a suitable towel to cover and carefully open the coolant expansion tank cap.

## **1.4 Safety Precautions when Working on A/C Systems**

**There is a risk of explosions from ignition sources.**

Risk of explosion from ignition sources near A/C systems and refrigerant canisters. Leaking refrigerant can ignite and cause an explosion. Severe bodily injury or death caused by explosions possible.

- ◆ Do not bring any ignition sources near A/C systems and refrigerant canisters.

### **Risk of suffocation and poisoning from refrigerant**

Dry cough and nausea to suffocation and poisoning are possible from refrigerant vapors. Refrigerant is heavier than air and accumulates in low-lying areas.

- ◆ Do not inhale any refrigerant vapors.
- ◆ Only work on the refrigerant circuit in well-ventilated spaces.
- ◆ Store refrigerant canisters in well-ventilated spaces.
- ◆ Do not work in and near low-lying areas.
- ◆ Switch on the exhaust extracting system.

### **Risk of frostbite from refrigerant**

Refrigerant can escape under pressure when working on the A/C system. Frostbite of skin and other parts of the body possible.

- ◆ Wear safety gloves.
- ◆ Wear protective eyewear.
- ◆ Extract or drain refrigerant and immediately open the refrigerant circuit.
- ◆ If the extraction or drainage takes longer than 10 minutes and the refrigerant circuit has not been opened, extract or drain the refrigerant again. Pressure has built up in the refrigerant circuit due to evaporation.

## 1.5 Safety Precautions during Road Test with Testing Equipment

**There is a risk of injury from unsecured testing equipment.**

If the front passenger side airbag unit deploys during an accident, testing equipment that is not properly secured will be tossed around dangerously.

- ◆ Strap down testing equipment on the rear seat.
- ◆ Have a second person operate the testing equipment on the rear seat.
- ◆ In vehicles with two seats, deactivate the front passenger airbag and move the front passenger seat as far back as possible.

## 1.6 Safety Precautions when Working on the Passenger Protection System

**Danger from unintentional release of the passenger protection**

Pyrotechnical components of the passenger protection may release unintentionally. This may result in death or severe physical injuries.

- ◆ Only specially trained personnel may work on the passenger protection.
- ◆ Repairs near passenger protection pyrotechnic components: mechanical or thermal load or injury can result in the loss of restraint functions in a collision or lead to unintentional deployment.
- ◆ Do not perform an electric continuity test or measurement in the ignition circuits. Only perform the visual inspection of the wire routing with the ignition switched off.
- ◆ The pyrotechnic components may be checked only when they are installed and with a vehicle diagnostic tester approved by the manufacturer.
- ◆ Pyrotechnic components must not be opened or repaired. Always use new parts.
- ◆ Only use original pyrotechnic components that are not damaged.
- ◆ Only disconnect and connect the airbag control module connector if the control module is securely bolted to the body.
- ◆ The airbag control module contains vehicle-specific data. Do not install in other vehicles.
- ◆ Follow the instructions for transport and storage of passenger protection components.

Refer to ⇒ Rep. Gr. 00 ; Transport and Storage .

**There is a risk of inhaling dust and gases immediately after pyrotechnic components are ignited.**

Dust and gases are released immediately after pyrotechnic components are ignited. If inhaled, dust and gases can impair health.

- ◆ Allow the vehicle to air out.
- ◆ Clean the vehicle interior while wearing respiratory protection.
- ◆ Avoid skin contact with pyrotechnic components.
- ◆ Follow any local applicable disposal guidelines.



### **Risk due to passenger protection with limited functionality**

The passenger protection functionality may be limited after a collision. This may result in death or severe physical injuries.

- ◆ Check the passenger protection after a collision.

Refer to ⇒ Rep. Gr. 00 ; Passenger Protection for Vehicles Involved in Collisions, Evaluating .

## **1.7 Safety Precautions when Working with Chemicals**

### **There are health risks**

Chemical substances can be absorbed via the skin, the respiratory system or by swallowing. This can lead to acute and chronic health complications.

- ◆ Observe the material safety data sheets and supplementary information from the manufacturers.
- ◆ Do not eat, drink, smoke, etc. when handling chemical substances.
- ◆ Use personal protective equipment.

## **1.8 Safety Precautions when Working with Compressed-Gas Canisters**

### **Risk of health and property damage**

Incorrect handling of compressed-gas canisters can lead to damages to health and property damage.

- ◆ When working with compressed-gas canisters, certain country-specific laws, standards and guidelines must be kept in mind.
- ◆ Observe the material safety data sheets and supplementary information from the manufacturers.
- ◆ Use personal protective equipment.

## **1.9 Safety Precautions when Working with Batteries**

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### **Risk of health and property damage**

Leaking acid can cause chemical burns. Oxyhydrogen gas that results from charging can lead to an explosion.

- ◆ Use personal protective equipment.
- ◆ Pay attention to the information and operating instructions on the battery.
- ◆ Touch the vehicle body before touching the battery in order to prevent sparks from static discharge.
- ◆ Keep countermeasures ready.
- ◆ Only perform battery procedures in suitable and well-ventilated locations.
- ◆ Work that creates sparks, such as grinding, welding, cutting work and open flames, is prohibited.
- ◆ Batteries whose "ALI (Acid Level Indicator)" is light yellow must be replaced. These cannot be tested or charged and a jump start cannot be given.
- ◆ Do not set any tools down on batteries.

- ◆ Do not tilt batteries because electrolyte can leak from the vent openings.
- ◆ On which the battery vents is relevant for safety.
- ◆ For applications in which a gas breather hose is used, pay attention to the correct seating of the gas breather hose and that the vent opening is closed on the opposite side.

## 1.10 Working with Special Tools and Equipment, Safety Precautions

### Safety precautions when working with special tools and equipment

There is a risk of injury from improperly handling special tools and equipment.

- ◆ Check special tools and equipment for proper function and any damage before use.
- ◆ Wear appropriate protective equipment.
- ◆ Observe the operating instructions enclosed with the special tool or equipment.
- ◆ Pay attention to secure footing and a uniform force distribution when working with removal tools.
- ◆ Pay attention to the repair information.

⇒ Rep. Gr. 00 ; Repair Manual, Information on Application



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## 2 Repair Information

⇒ [“2.1 Laws, Standards, Guidelines and Risk Assessments”, page 7](#)

⇒ [“2.2 Information about Using the Repair Manual”, page 7](#)

⇒ [“2.3 Replacement Parts, Operating Materials, and Consumables”, page 8](#)

⇒ [“2.4 Transport and Storage”, page 10](#)

⇒ [“2.5 Qualification”, page 10](#)

⇒ [“2.6 Environmental Protection”, page 10](#)

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### 2.1 Laws, Standards, Guidelines and Risk Assessments

- ◆ Country-specific laws, standards and guidelines must be adhered to, in addition to the repair manual content.
- ◆ The employer must determine the dangers by assessing the work conditions and thus derive measures for work safety. Such a risk assessment is necessary for each procedure.

### 2.2 Information about Using the Repair Manual

- ◆ Follow the process in the repair manual to consistently repair a vehicle.
- ◆ The repair manual consists of several assembly groups, which depend on each other or build on each other.
- ◆ Completeness is only ensured in the overall context.
- ◆ Follow links to other assembly groups.

#### Tools:

- ◆ The special tools and equipment specified in the repair manual must be used.
- ◆ Observe the operating instructions enclosed with the special tool and equipment.

- ◆ If no special tool is specified, then a commercially available tool can be used.

## 2.3 Replacement Parts, Operating Materials, and Consumables

### Replacement Parts:

- ◆ The degree of disassembly described in the repair manual has been approved by the manufacturer and must be followed.
- ◆ In order to ensure that the repair quality is in line with the manufacturer specifications, using original replacement parts is recommended. Refer to the ⇒ Electronic Parts Catalog (ETKA) .
- ◆ All information and technical specifications are for original replacement parts.
- ◆ The components must be checked for damage and function before installation.

### Coolant hoses installation guidelines:

- ◆ Only use water/coolant additive to lubricate the coolant hoses.

### Installation guidelines for radiators, condensers, and charge air coolers:

- ◆ After installation, the radiator, condenser, and charge air cooler may have slight indentations on the slats. This is not damage. Do not replace the radiator, condenser, or charge air cooler because of those small indentations.

### Installation guidelines for passenger protection components:

- ◆ Pyrotechnic components must not be opened or repaired. Only use new parts.
- ◆ Pyrotechnic components that have fallen or show signs of damage must not be installed.
- ◆ Protect the airbag control module, pressure and crash sensors from bumps and impacts. Do not use crash sensors that have fallen onto the floor.
- ◆ Remove the pressure sensor when performing body work on the door.
- ◆ Do not allow the pressure sensor to become dirty and do not use compressed air near the pressure sensor.
- ◆ Protect the pressure sensor from filings or shavings (for example, when installing door speakers later).
- ◆ Do not use cavity sealant or spray lubricant in the area near the pressure sensor.
- ◆ Pressure sensors must be protected from moisture when installing.
- ◆ For the pressure sensor to function correctly, the door must seal correctly after it is assembled.
- ◆ All components (such as the cover, speaker, and door trim panel) must be installed correctly.
- ◆ Door trim panel clips seal the system. Replace any fasteners that are damaged.

### Operating Materials and Consumables:

- ◆ In order to ensure that the repair quality is in line with the manufacturer specifications, it is recommended to use oper-

ating materials and consumables offered by the manufacturer. Refer to the ⇒ Electronic Parts Catalog (ETKA) .

- ◆ Follow the manufacturer instructions provided on the label.
- ◆ Use operating materials and consumables before the expiration date.

Information about coolant:

- ◆ Used coolant cannot be used again.
- ◆ Demineralized, deionized, distilled water must be used to mix the coolant concentrate due to country and region-specific differences in the contents in tap water.
- ◆ Only use coolant additives approved for the vehicle.
- ◆ The freeze protection of the coolant must be set to -25 °C (-13 °F), for countries with an arctic climate to -36 °C (-32.8 °F). If a stronger freeze protection is necessary due to the climate, then the freeze protection may be increased. If necessary, the freeze protection can be set to a minimum of -52 °C (-61.6 °F), otherwise the cooling effect of the coolant will decrease.
- ◆ Coolant mixture ratio for 5 liters of coolant:

Freeze protection	Proportion of coolant concentrate	Coolant concentrate	Water according to the criteria mentioned above
-25 °C (-13 °F)	40%	2.0 liters	3.0 liters
-36 °C (-32.8 °F)	50%	2.5 liters	2.5 liters
-52 °C (-61.6 °F)	60%	3.0 liters	2.0 liters

- ◆ Coolant mixture ratio for 10 liters of coolant:

Freeze protection	Proportion of coolant concentrate	Coolant concentrate	Water according to the criteria mentioned above
-25 °C (-13 °F)	40%	4.0 liters	6.0 liters
-36 °C (-32.8 °F)	50%	5.0 liters	5.0 liters
-52 °C (-61.6 °F)	60%	6.0 liters	4.0 liters

Information about the brake fluid:

- ◆ Brake fluid is poisonous. Due to its caustic nature, it must also never be brought into contact with trim panels or body parts.
- ◆ Brake fluid is hygroscopic. This means that brake fluid absorbs moisture from the air.
- ◆ The containers must always be stored in another container and must be closed immediately after every use.
- ◆ Rinse off any leaking brake fluid with water.

Information about the refrigerant oil:

- ◆ Refrigerant oil is highly hygroscopic. This means that refrigerant oil takes the moisture from the surrounding air.
- ◆ The containers must always be stored in another container and must be closed immediately after every use.

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## 2.4 Transport and Storage

- ◆ Pay attention to country-specific transport and storage requirements.
- ◆ Pay attention to component specific transport and storage requirements.

### Storage guidelines:

#### Passenger Protection Components:

- ◆ Do not allow the airbag units to come into contact with grease, solvents, or cleaning solutions.
- ◆ Do not expose gas generators to temperatures above 100 °C (212 °F).
- ◆ Store uninstalled driver and front passenger airbag units with the airbag deployment opening facing up.
- ◆ Place removed airbag units into a transport container or onto a clean, level surface with a soft cushion underneath. Fold carefully and prevent damage.
- ◆ Pressure sensors must be protected from moisture when storing.

### Transport guidelines:

#### Components containing liquids:

- ◆ Components containing liquids must be drained before transport. If it is not possible to drain the component, then the parts must be packed properly.
- ◆ If a fault is preventing drainage, contact the importer.
- ◆ Immediately seal the connection ports of components that fluid after removal or residual draining. If available, use the plugs from the new part.

## 2.5 Qualification

- ◆ Only trained personnel may perform repair work.
- ◆ The qualifications specified in the repair manual are required to ensure the repair is performed safely and correctly.
- ◆ The implementation of the qualification depends on the respective market, and country-specific requirements must be taken into account.
- ◆ The employer is responsible for ensuring personnel have the necessary qualification.
- ◆ The Web-Based Training and Self-Study Programs offered by the manufacturer are basic principles on how to perform a given repair.
- ◆ Web-Based Training And Self Study Programs describe the design and function of a technology.

## 2.6 Environmental Protection

- ◆ Country-specific laws and regulations on recycling/disposal must be taken into account.
- ◆ Components, working materials and expendable items must be recycled/disposed in an environmental friendly way.



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## 2.7 Guidelines for Clean Working Conditions

Even minor contamination can lead to malfunctions and leaks. Therefore, follow these guidelines for clean working conditions during all work:

- ◆ Thoroughly clean the connection points/maintenance openings and the surrounding area before loosening/opening.
- ◆ Use lint-free cleaning cloths to clean.
- ◆ Immediately seal lines, connections and components after opening using clean plugs from the Engine Bung Set - VAS 6122- .
- ◆ Place removed components on a clean surface and cover them with lint-free cleaning cloths.
- ◆ Carefully cover or seal opened components.
- ◆ Immediately remove leaking liquids and clean the affected areas.
- ◆ Only install clean components. Wear clean gloves and remove replacement parts from the packaging just before installing.
- ◆ Remove any transport packaging, protective packaging, and caps just before installing.
- ◆ Protect the disconnected electrical or optical connectors from dirt and moisture and only connect when they are dry.

Vehicle and Engine Wash:

- ◆ Never direct the jet of water from a pressure washer at electrical components or connectors when cleaning the vehicle or engine.

## 2.8 Identification Plates

- ◆ When replacing components, the existing identification plates on the used parts that indicate the replacement part number in the ⇒ Electronic Parts Catalog (ETKA) , must be transferred to the new part according to the specifications.
- ◆ Replace any identification, warning and information labels on vehicle components that are unreadable or damaged, and re-attach them in the same location. Allocation. Refer to the ⇒ Electronic Parts Catalog (ETKA) .

## 2.9 Bolts and Nuts

- ◆ All threaded connections must be tightened to the specification to ensure safe operation in road traffic.
- ◆ Loosen the bolts opposite the tightening sequence.
- ◆ Loosen or tighten bolts or nuts that do not have a specified tightening sequence in a diagonal sequence in stages.
- ◆ Always replace self-locking nuts.
- ◆ Always replace self-locking bolts. For exceptions, see the Overviews.
- ◆ Always replace corroded bolts and nuts.
- ◆ Threaded bolt holes where self-locking bolts or bolts with locking compound that will be installed must be cleaned (for example, using a thread tap). Otherwise there is the risk that the bolts could break off when they are removed again.

- ◆ Threads in blind holes must be free of fluids and contamination.
- ◆ The tightening specifications given apply to non-lubricated bolts and nuts.
- ◆ The specified tightening specifications apply to standard tools. When using socket wrenches a correction value must be considered.

Self-tapping bolts:

- ◆ Installing into existing threads: position the self-tapping bolts by hand and insert until they find the old threads. Then tighten the bolts to the tightening specifications.
- ◆ Install in the new tapping threads: position the self-tapping bolts on the holes and install all the way under light pressure. The bolts cut a new thread by doing so. Then tighten the bolts to the tightening specifications.

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## 2.10 Impact Wrench, Using

Pay attention to additional information in the repair manual.

Exceptions:

- ◆ No impact wrenches are allowed when working within an opened high-voltage battery and when working near natural gas systems. Pay attention to the general information.

Removing/detaching:

- ◆ Removing bolts and nuts using a suitable impact wrench is generally permitted.
- ◆ Bolts (bolt head and protruding threads) and nuts must be cleaned before removal.

Installing/attaching:

Installing and attaching nuts is permitted using a suitable impact wrench when paying attention to the following conditions.

- ◆ Position the bolts and nuts by hand.
- ◆ Only use an impact wrench with an adjustable speed and torque range.
- ◆ The impact function of the impact wrench may not be used.
- ◆ The maximum speed must not exceed 300 RPM.
- ◆ Use suitable screwdriver bits (for example plastic-coated bits) close to delicate surfaces.
- ◆ Install or attach bolts with locking fluid or self-locking nuts with low speed.
- ◆ Only install or attach bolts and nuts until they stop.
- ◆ Apply the additional tightening specification by hand using a torque wrench.
- ◆ Use a torque wrench with angled rotation function or a rigid torque wrench for the prevailing angle of torque.

## 2.11 Contact Corrosion

- ◆ Contact corrosion can occur if incorrect fasteners (bolts, nuts, washers, etc.) are used. For this reason, only fasteners with a special surface coating may be installed.
- ◆ Original parts and original accessories are recommended which were developed and checked for the respective intended purpose.



## 2.12 Seals and Gaskets

- ◆ Check the sealing surfaces of the seals and gaskets for burrs or damages and clean thoroughly before installing.
- ◆ Check seals and gaskets for damage before installing.
- ◆ The respective overview specifies if seals and gaskets must be replaced. If no overview is provided, these parts must always be replaced after removal.
- ◆ Make sure the seals are seated correctly on the cables or in the groove.

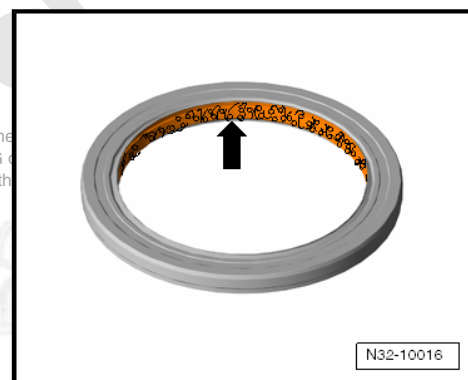
Unless specified otherwise:

- ◆ Only coat the seals at the outer circumference with the respective medium (oil, coolant, refrigerant oil, etc.).

Shaft seals:

- ◆ Lightly oil the outer edge of shaft seals before installing.
- ◆ The open side on the shaft seals faces the fluid to be sealed off.
- ◆ Certain shaft seals (for example PTFE) must be installed dry. Pay attention to the repair manual for this.
- ◆ For shaft seals in the transmission area, the space in between the sealing lips -arrow- must be filled with radial shaft seal sealing grease half way.

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## 2.13 Adhesive Surfaces

- ◆ The adhesive surfaces must be free of oils, silicone, Teflon, dirt, humidity and oxide coatings.
- ◆ Do not perform welding, sanding or polishing procedures in immediate proximity.
- ◆ Do not use silicone sprays in the work area.
- ◆ Pay attention to further guidelines for adhesive surfaces in the repair manual.

## 2.14 Connectors, Disconnecting

- ◆ Before disconnecting a connector, always make sure that the ignition is switched off and the vehicle key or other start authorization systems (such as a smartphone) are outside of the vehicle interior. This will prevent the vehicle from switching on unintentionally. Also, this can result in unintended DTC memory entries that must be cleared after the repair.
- ◆ Discharge electrostatic electricity immediately before disconnecting a connector by briefly touching the door striker.
- ◆ Do not touch open contact pins with hands.
- ◆ When connecting a connector, make sure the locking mechanism on the connector is latched correctly. Pull on it briefly to check if it is locked correctly.

## 2.15 Line Routing and Securing

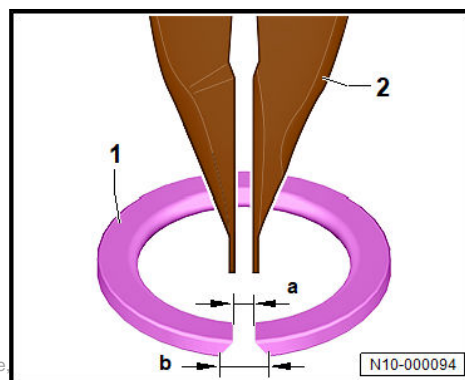
- ◆ Lines include: fuel, coolant, hydraulic, vacuum, EVAP system, high-voltage, and refrigerant lines as well as wires.
- ◆ Risk of damage to lines is possible from moving or hot components.
- ◆ Make sure there is sufficient clearance to moving or hot components.
- ◆ Route lines in their original locations.
- ◆ If necessary, draw sketches or take pictures.
- ◆ Label lines before removal to prevent interchanging them and to ensure the original installation position.
- ◆ Check the routing after securing lines. They must be inserted in their brackets and must not come into contact with other components.
- ◆ Replace damaged cable ties, wire brackets and fasteners.

## 2.16 Circlips

- ◆ Do not stretch circlips.
- ◆ Replace damaged or stretched circlips.
- ◆ Circlips must fit into the base of the groove.

Installation position for circlips -1- with beveled ends:

- ◆ Hold the side of the narrower opening -a- with the pliers -2-.
- ◆ The side with the wider opening -b- faces toward the component to be secured.



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## 2.17 Working on the Refrigerant Circuit

- ◆ Refrigerant oil is hygroscopic, which means it absorbs moisture from the surrounding air. If the refrigerant circuit has been opened for a longer period of time, the refrigerant oil and the drying element will be saturated with moisture. Before charging the refrigerant circuit, evacuate it thoroughly and replace the drying element.
- ◆ Only perform welding and soldering work near A/C system components while the refrigerant circuit is drained.
- ◆ It is possible that the plastic foil on the inside will tear and destroy the refrigerant lines in this way. Never bend refrigerant lines with a radius smaller than  $r = 10 \text{ cm}$ .

North American Region (NAR):

- ◆ Replace faulty components with original parts.
- ◆ Evaporators must meet the applicable SAE standards for the vehicle.

## 2.18 Working on Seat Occupant Detection System for Front Passenger Airbag Deactivation

- ◆ The seat occupant detection system sensor must not be kinked.
- ◆ The sensor must be replaced if it is damaged.
- ◆ The mat, fleece and all covers must be installed without creases.
- ◆ Make sure the seat cushion and cover are positioned correctly when installing.
- ◆ Replace all upholstery clips or clips and make sure they are positioned correctly on the seat.
- ◆ Make sure that there are no objects on the seat before and during the basic setting.
- ◆ Using seat coverings (such as cushions) impairs the function of the seat occupant detection system and thus the effectiveness of the airbag system.

## 2.19 Vehicle Battery

### Battery replacement and battery degassing

- ◆ When replacing the vehicle battery, make sure that there is no opened bleed hole near the positive terminal.
- ◆ If there is an open bleed hole in this area, it must be sealed with a plug and the bleed hole near the negative terminal must be opened.
- ◆ Pay attention to the battery type. Correct designation of the battery. Refer to the → Electronic Parts Catalog (ETKA) .

### Severely Discharged Batteries

- ◆ Severely discharged batteries freeze faster.
- ◆ Batteries that have been frozen must no longer be used.
- ◆ Severely discharged batteries in vehicles that have not been registered are to be replaced before delivery. Damage cannot be ruled out.
- ◆ Batteries that were not in operation for a longer period of time, for example in vehicles in storage, discharge on their own.
- ◆ With severely discharged batteries the battery electrolyte is almost all water, because the proportion of acid has been greatly reduced.
- ◆ Severely discharged batteries are sulfating, that means that the entire panel surfaces harden.
- ◆ The sulfating process may be largely reversed if a severely discharged battery is recharged immediately.
- ◆ If the battery is not recharged, the plates will continue to harden, and the ability to accept a charge will decrease. This results in reduction of battery performance.

## 2.20 Vehicles Involved in Collisions, Evaluating

⇒ "2.20.1 Vehicles Involved in Collisions, Evaluating, Basic Principles", page 16

⇒ "2.20.2 Vehicles Involved in a Collision, Evaluating, Suspension", page 16

⇒ "2.20.3 Vehicles in Collisions, Evaluating, Passenger Protection", page 17

### 2.20.1 Vehicles Involved in Collisions, Evaluating, Basic Principles

- ◆ When servicing components on vehicles involved in collisions, damage can remain undiscovered.
- ◆ Undiscovered damage could lead to serious subsequent damage when driving later.
- ◆ Recommendation: have accident damage assessed by an automotive engineering expert.
- ◆ Check the DTC memory entries using the ⇒ Vehicle diagnostic tester.
- ◆ Process any DTC memory entries that have been set.
- ◆ Once repaired, check the affected systems once more for DTC memory entries.

### 2.20.2 Vehicles Involved in a Collision, Evaluating, Suspension

Visual inspection and function test of the suspension:

- ◆ Check all components for deformation, cracks and other damage.
- ◆ Replace damaged components.
- ◆ Perform an axle alignment.

Visual inspection and function test of the brake system:

- ◆ Visual inspection for deformations and cracks.
- ◆ Check the brake system, including the anti-lock braking system.

Visual inspection and function test of the steering system:

- ◆ Visual inspection for deformations and cracks.
- ◆ Check for play in the tie rod joints and the steering gear.
- ◆ Visual inspection for faulty boots.
- ◆ Inspect electric lines, hydraulic lines and hoses for chafing, cuts and kinks.
- ◆ Check hydraulic lines, threaded connections and steering gear for leaks.
- ◆ Check steering gear and lines for secure fit.
- ◆ Check for correct function over the entire steering angle by turning the steering wheel from one stop to the other. It must be possible to turn the steering wheel with a constant level of force without becoming stuck.

Visual inspection and function test of the wheels and tires:

- ◆ Check tires for cuts and impact damage in tread and on sides. Refer to ⇒ Wheel and Tire Guide - General Information; Rep. Gr. 44 ; Tires, Evaluating .
- ◆ Check the tires for run-out and imbalance.
- ◆ Check the tire pressure.
- ◆ Replace damaged tires/rims.

## 2.20.3 Vehicles in Collisions, Evaluating, Passenger Protection

### Check electronic components:

- ◆ Check the airbag control module DTC memory entry using the ⇒ Vehicle diagnostic tester.
- ◆ Replace components according to the repair manual.
- ◆ Visually inspect the airbag control module and the acceleration/pressure sensors. The component must be replaced if there is damage to the housing deformation within 20 cm of the component.
- ◆ Visually inspect all passenger protection pyrotechnic components. All pyrotechnic components that are recognizable as deployed must be replaced including their fasteners.
- ◆ Visually inspect components near pyrotechnic components. Pyrotechnic components with deformation or damage that can be detected must be replaced. Covers and cushions must be replaced if the side airbags deploy.
- ◆ All pyrotechnic components for passenger protection within 10 cm of mechanical deformations must be replaced.
- ◆ Visually inspect the seat occupant detection system sensor and replace if damaged.
- ◆ If seat rails and/or the seat pan are replaced due to deformations, the seat occupant detection system must be replaced. Then perform the basic setting for the seat occupant detection system control module, using the ⇒ Vehicle diagnostic tester.

### Check the seat belt latches:

- ◆ If a seat belt tensioner deployed while the seat belt was fastened, replace the seat belt latch, seat belt tensioner, and the belt height adjuster.
- ◆ Check the seat belt latch for cracks and chips. If damage is found, replace the entire seat belt with seat belt latch.
- ◆ Insert the belt tongue into the seat belt latch until it clicks into place. Check if the locking mechanism is latched correctly by pulling firmly on the belt webbing.

### Condition

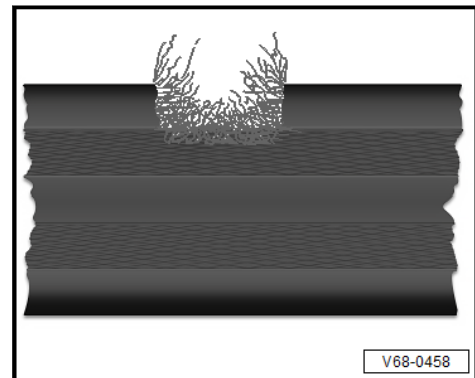
- The buckle tongue must remain locked in the seat belt latch during at least five tests by firmly pulling on the seat belt. Otherwise the entire seat belt with seat belt latch must be replaced.
- During at least five tests, the buckle tongue must release from the seat belt latch when the button on the seat belt latch is pressed and the belt webbing is free of tension. Otherwise the entire seat belt with seat belt latch must be replaced.

**Check the seat belt webbing:**

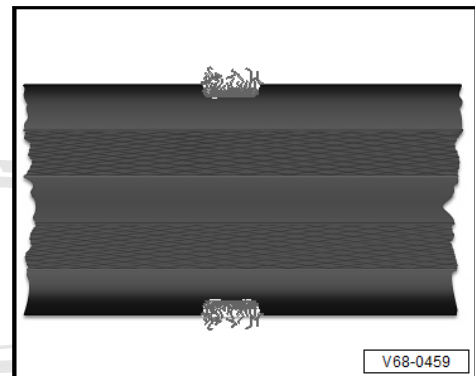
- ◆ Pull the seat belt webbing completely out of the automatic belt retractor.
- ◆ Clean dirty seat belt webbing with mildly soapy water.

**Condition**

- If damage as stated under points 1, 2 and 4 is found on a vehicle with accident damage, the seat belt and automatic belt retractor must be replaced together with the seat belt latch.
  - If damage as stated under points 1, 2, 3 and 4 is found on a vehicle without accident damage, only the damaged seat belt and automatic belt retractor must be replaced.
- ◆ 1 - Seat belt webbing cut, torn or frayed.



- ◆ 2 - Webbing loops torn at the belt edge.



- ◆ 3 - Burn marks from cigarettes or similar.



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- ◆ 4 - Check for fraying in the area of the seat belt relay -magnified area-.

#### **Automatic Belt Retractor (Locking Function), Checking:**

- ◆ Extend the belt webbing and allow it to retract.

##### **Condition**

- Check for unusual noises and smooth operation.
- If there is difficulty extending or retracting the belt, first check if the position of the belt retractor has been changed.
- ◆ Tug the seat belt webbing out of the automatic belt retractor quickly and firmly.

##### **Condition**

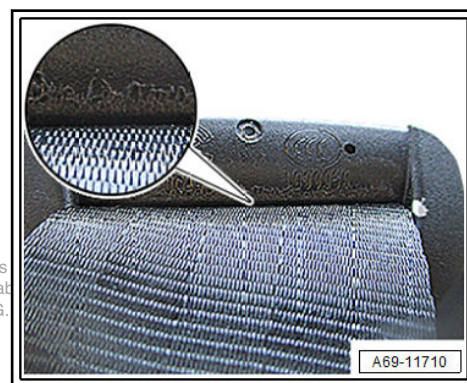
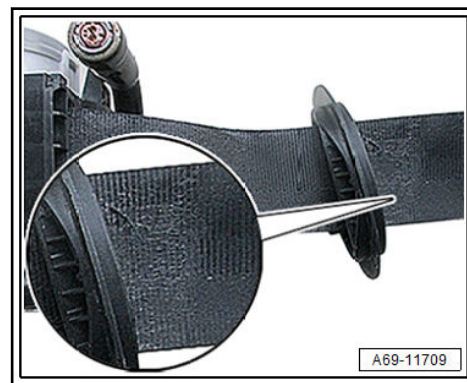
- Without the locking function, the seat belt and the automatic belt retractor with the seat belt latch must be replaced completely.

#### **Check the seat belt relays and buckle tongues:**

- ◆ Check the plastic for deformation, chips, heat damage, and cracks.

##### **Condition**

- If there are parallel cracks and/or damage, the entire seat belt with the seat belt latch must be replaced.
- ◆ Plastic-coated relays will show heat damage -magnified area- if the belt system experiences severe stress (belt was fastened during a collision).



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- ◆ After the belt system is strained (belt was fastened during a collision), check for frayed fibers in the area of the belt relays -magnified area-.

**Check the fasteners and mounting points:**

Inspection items:

- ◆ Seat belt latch tongue deformed (stretched)?
- ◆ Height adjustment not working or difficult to operate?
- ◆ Mounting points (seat, pillar, underbody, LATCH) deformed or threads damaged?

**Condition**

- If damage is found on the fasteners, the seat belt together with the seat belt latch must be replaced.
- If components of the seat belt system are removed due to an accident, the seat belt system bolts must be replaced.
- Deformed or damaged mounting points must be replaced.
- In the event of damage not resulting from an accident (such as wear), only the respective damaged component must be replaced.



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**erWin**



## 54 – Paint

### 1 Paint System

⇒ [“1.1 Factory Paint Structure”, page 21](#)

#### 1.1 Factory Paint Structure

Factory paint structure. Refer to ⇒ Paint- General Information;  
Rep. Gr. 00 ; General Information; Factory Paint Structure .

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## 2 Vulnerable Stone Impact Areas

⇒ "2.1 Vulnerable Stone Impact Areas on the Body, Overview",  
page 22

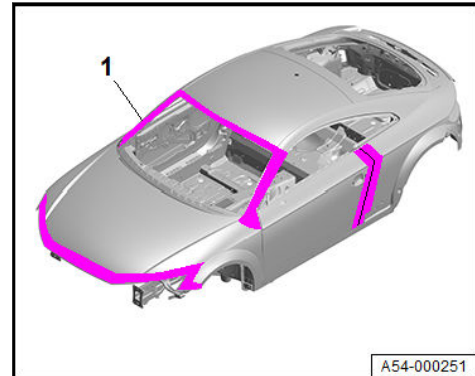
### 2.1 Vulnerable Stone Impact Areas on the Body, Overview

#### Coupe Body

1 - Avoid areas that have been sanded through

##### Condition

- Pay attention to the layer thickness. Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; General Information; Factory Paint Structure .

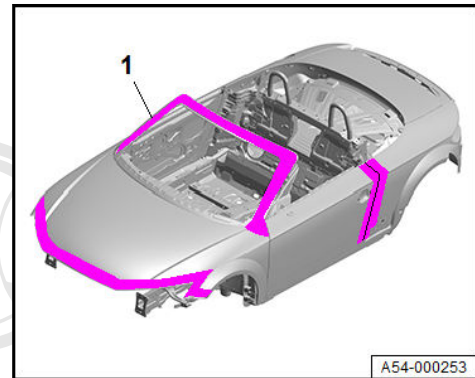


#### Roadster Body

1 - Avoid areas that have been sanded through

##### Condition

- Pay attention to the layer thickness. Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; General Information; Factory Paint Structure .

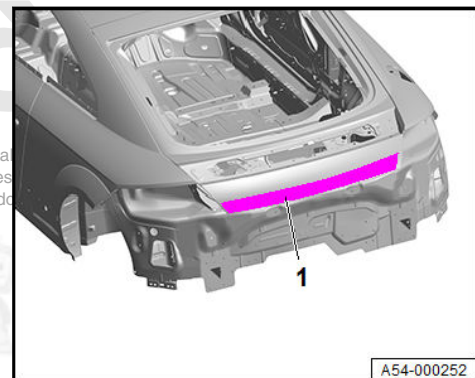


#### Hatch

1 - Avoid areas that have been sanded through

##### Condition

- Pay attention to the layer thickness. Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; General Information; Factory Paint Structure .



## 3 Seam Sealing

⇒ [“3.1 Seam Sealing General Information”, page 23](#)

⇒ [“3.2 Seam Sealing, Body Center”, page 23](#)

### 3.1 Seam Sealing General Information

Only the most important details of the body seal are shown in the illustration.

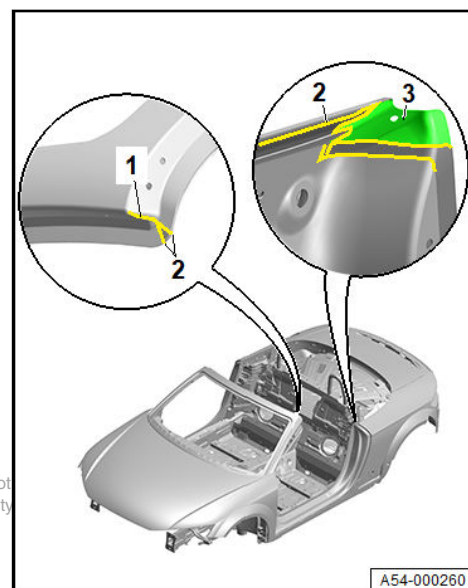
Condition

- The sealant must only be applied on the primed surfaces.
- Smoothen out the sealing seams in the area of attached components.
- Threaded pins, weld nuts with M-threads, as well as all other pins and contact surfaces must be functional.
- The cut edges can be sealed using an approximately 20 mm wide seal.
- A coarse seam sealing must have an overlap of sealant a total 20 mm and a thickness of 2 mm must be guaranteed.
- A fine seam sealing must have a overlap of sealant of at least 3 mm and a thickness of 2 mm.
- When spreading and smoothing the seal, pay attention that panel edges to be protected are not uncovered.

### 3.2 Seam Sealing, Body Center

Roadster

- 1 - Smooth the Seam Seal
- 2 - Overlap the Seam Seal to the Laser Seam
- 3 - Before installing coat with cavity protection



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## 4 Underbody Protection

⇒ "4.1 Underbody Protection General Information", page 24

⇒ "4.2 Underbody Protection - Overview with Various Layer Thicknesses", page 24

### 4.1 Underbody Protection General Information

#### Condition

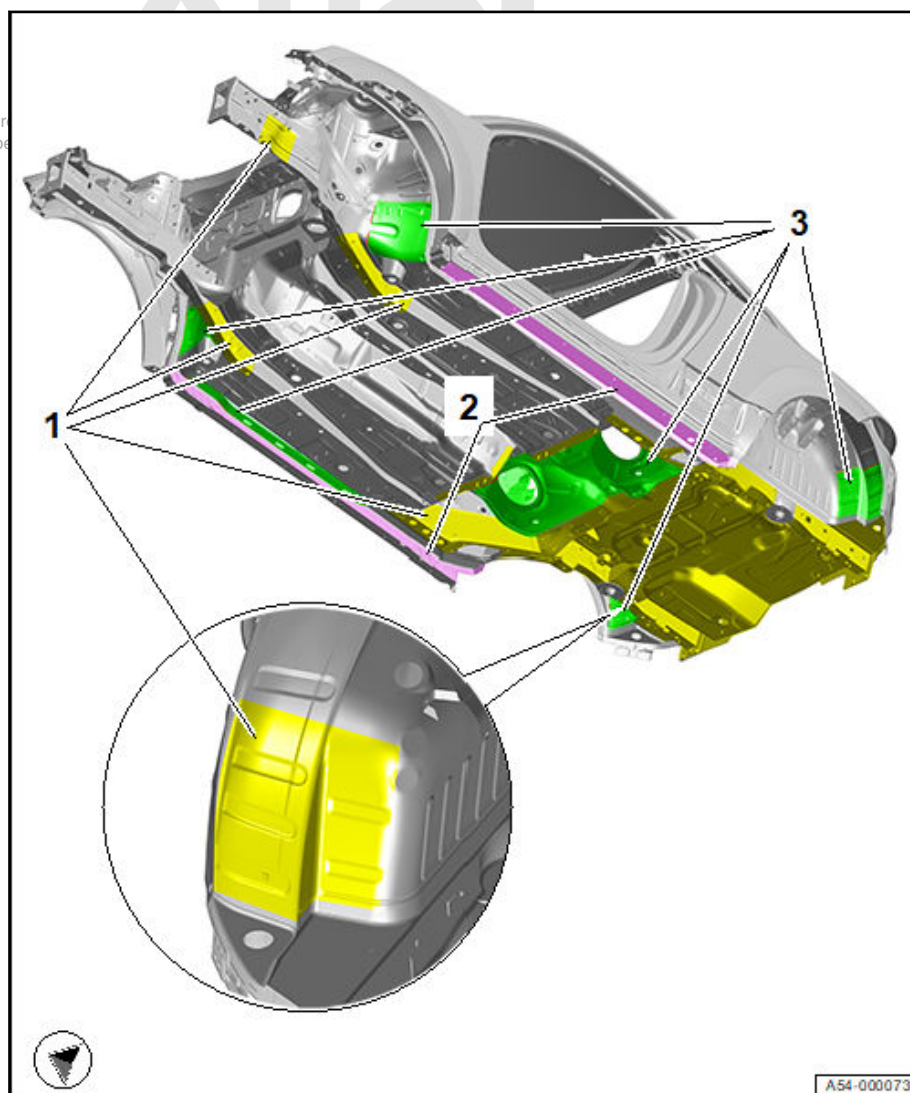
- The underbody protection is to be restored according to its original conditions in appearance and layer thickness.
- Water drain holes must stay clear.
- Threaded pins, weld nuts with M-threads, and all other pins and contact surfaces must be functional after applying the underbody protection.

### 4.2 Underbody Protection - Overview with Various Layer Thicknesses

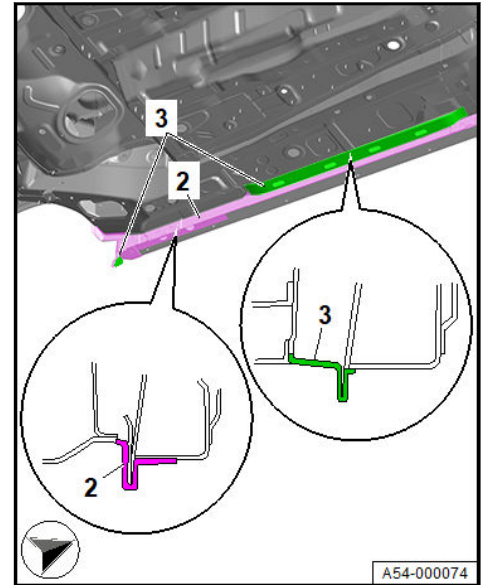
1 - Layer thickness light thin film = 0.08 - 0.10 mm

2 - Heavy layer thickness = 1.3 - 1.8 mm

3 - Medium layer thickness = 0.5 - 0.9 mm



- 2 - Heavy layer thickness = 1.3 - 1.8 mm
- 3 - Medium layer thickness = 0.5 - 0.9 mm



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## 5 Contrasting Colors

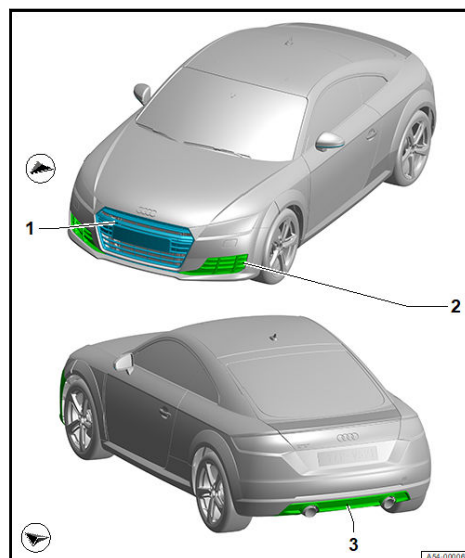
⇒ **“5.1 Contrasting Colors Complete Vehicle”, page 26**

### 5.1 Contrasting Colors Complete Vehicle

- 1 - Radiator Grille
- 2 - Air guide grille
- 3 - Diffuser

Component	Basic	S model	S line
1	Stone Grey 1QP	Platinum Gray Matte 1RR	High-Gloss Black T94
2	Satin Black Matte 3FZ	Satin Black Matte 3FZ	Satin Black Matte 3FZ
3	Satin Black Matte 3FZ	Platinum Gray Matte 1RR	Satin Black Matte 3FZ

- ◆ Exact PR information using the vehicle identification.
- ◆ Accessories may have a different color. Refer to the ⇒ Electronic Parts Catalog (ETKA) / Materials Catalog / Accessories Catalog .
- ◆ Determine the corresponding contrast color in the VIN inquiry. Refer to the ⇒ Electronic Parts Catalog (ETKA) .
- ◆ Because the scope of painting can be variably ordered, this information is supplied without liability.



#### Paint Code and Color Coding

Paint Code	Color Designation
1QP	Stone Gray Mixture formula present
1RR	Platinum Gray Matte Mixture formula present
3FZ	Satin Black Matte Mixture formula present
T94	High-Gloss Black Mixture formula present

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## 6 Paint Repairs

⇒ "6.1 Component Paint Repair", page 27

⇒ "6.2 Sensors Paint Repair", page 29

### 6.1 Component Paint Repair

#### Coupe

##### 1 - Roof Antenna

- ☐ Never loosen from the dust seal, there is a risk of malfunction

##### 2, 5 - Plastic Components

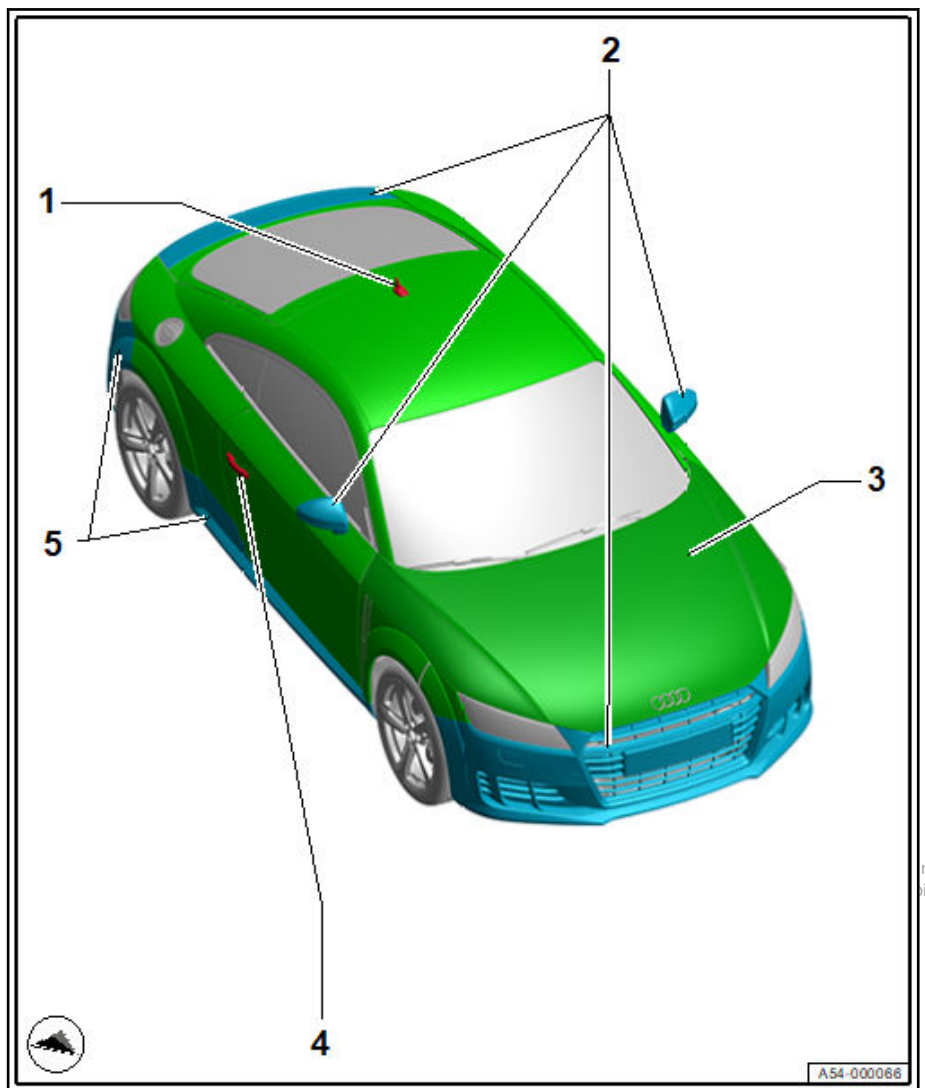
- ☐ Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; Original Products; Plastic Primer .

##### 3 - Aluminum Components

- ☐ Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; General Information; Factory Paint Structure .

##### 4 - Door Handle with Keyless Function

- ☐ Check the VIN if the vehicle is equipped with a keyless function.
- ☐ Maximum layer thickness 200 µ
- ☐ Filler paste not allowed



not  
ility

#### Roadster



#### 1 - Antenna

- ❑ Never loosen from the dust seal, there is a risk of malfunction

#### 2, 5 - Plastic Components

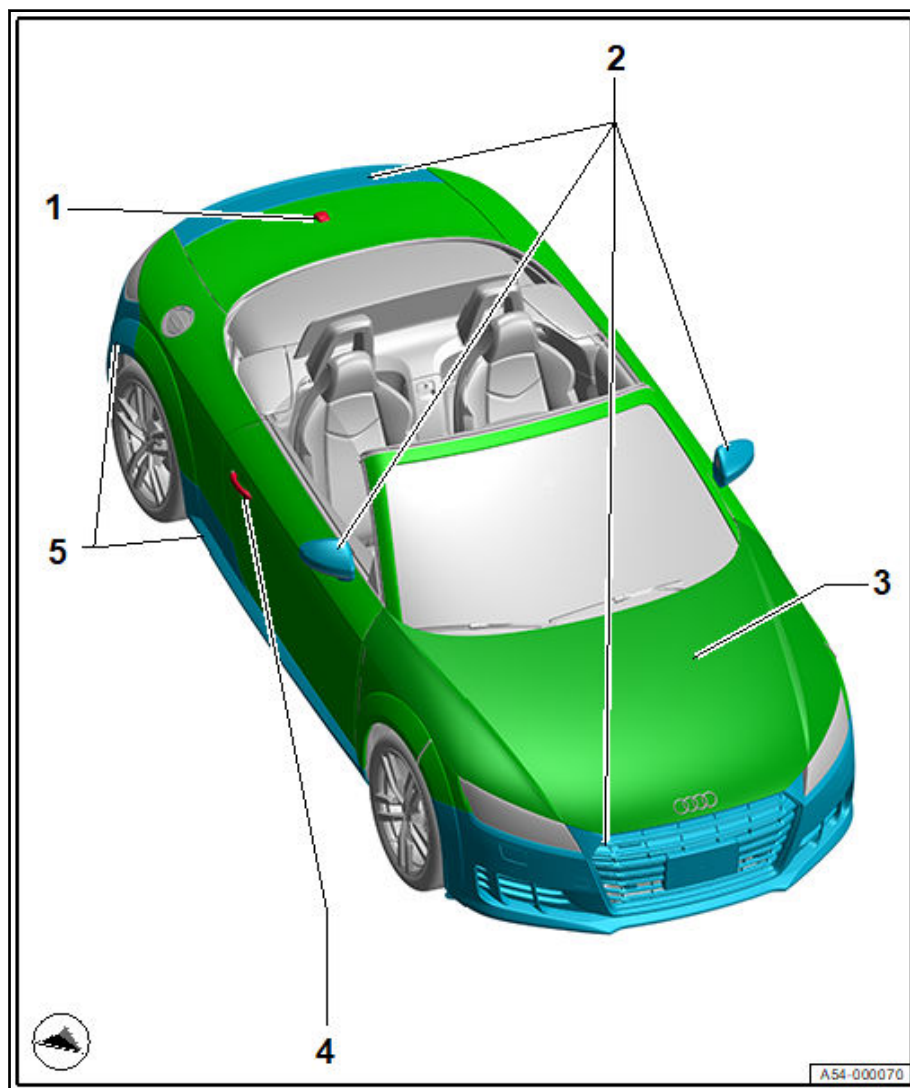
- ❑ Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; Original Products; Plastic Primer .

#### 3 - Aluminum Components

- ❑ Refer to ⇒ Paint - General Information; Rep. Gr. 54 ; General Information; Factory Paint Structure .

#### 4 - Door Handle with Keyless Function

- ❑ Check the VIN if the vehicle is equipped with a keyless function.
- ❑ Maximum layer thickness 200 µ
- ❑ Filler paste not allowed





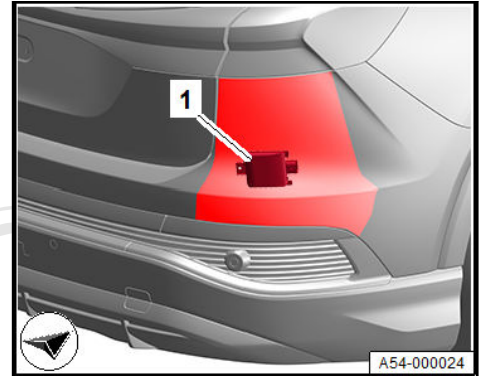
## 6.2 Sensors Paint Repair

Painting a bumper cover with lane change assistance -1-

Check the VIN if the vehicle is equipped with a radar system.

Condition

- Maximum layer thickness of 150 µ in the area of sensor/control modules.
- Do not perform plastic repairs or use filler paste within a 25 cm radius.
- Triple painting the bumper cover is not permitted. Check if a painting has already taken place by grinding.
- No spot repair in front of sensors.
- Cover the inner area of the bumper in case of overspray.
- Calibrate the lane change assistance after removal of the bumper. Refer to ⇒ Electrical Equipment; Rep. Gr. 96 ; Lane Change Assistance; Lane Change Assistance, Calibrating .



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# Cautions & Warnings

**Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.**

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Audi retailer or other qualified shop. We especially urge you to consult an authorized Audi retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Audi.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Audi is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Audi retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Audi Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

# Cautions & Warnings

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.
- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly, do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Audi specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

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# Cautions & Warnings

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Audi Service technicians should test, disassemble or service the airbag system.
- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Audi Service technicians using the Audi Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

**I have read and I understand these Cautions and Warnings.**



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